STATEMENT OF WORK

Gasco Sediments Site
Portland Harbor Superfund Site
Portland, Oregon

1 INTRODUCTION

This Statement of Work (SOW) describes the work that shall be carried out by the Respondents (NW Natural and Siltronic Corporation) as they implement a final sediment remedy investigation, Engineering Evaluation/Cost Analysis (EE/CA) and design for the Gasco Sediments Site (Site) within the Portland Harbor Superfund site.[1] This SOW is attached to the Administrative Settlement Agreement and Order on Consent (Settlement Agreement) for the Site, and is incorporated as an enforceable part of the Settlement Agreement. This SOW is consistent with both the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and the National Contingency Plan (NCP). Any discrepancies between the Settlement Agreement and SOW are unintended, but in the event of an inconsistency, the Settlement Agreement will control.

The project goal is the further characterization, studies, analysis, and design for a final remedy at the Site to facilitate construction of the remedial action to begin expeditiously following issuance of a Record of Decision (ROD) for the Portland Harbor Superfund Site. This action will include preference for removal of in-river materials containing "substantial product" (as defined in 3.6.2.1 of this SOW) such as Non Aqueous Phase Liquid (NAPL) and tar. It is anticipated that remedial action will be implemented under a consent decree following EPA issuance of the ROD. However, EPA reserves its rights and authority to order the Respondents to implement all or any portion of the necessary work under its removal or remedial order authorities.

This SOW describes the work to be conducted to meet the above project goal including:

- Section 2 – Project Context, which describes how the project fits into the other harbor-wide and Gasco site remediation activities and risk management principles that guide the work under the Settlement Agrement.
- Section 3 – Work to Be Performed, which describes the tasks to be performed and deliverables to be submitted as well as the Remedial Action Objectives (RAOs) for the project.
- Section 4 – Project Schedule for Major Deliverables, which describes the proposed schedule and dates for key activities.

2 PROJECT CONTEXT

This section describes conceptually how the project fits into the other harbor-wide and Gasco site remediation activities (programmatic sequence) and is not a substantive commitment or requirement of this SOW or the Settlement Agreement, nor is it intended to limit EPA's response or enforcement authorities, including determining the need for response action or the timing for same. The sequencing description is useful for understanding the overall project goal for the work under the Settlement Agreement. This section also describes risk management principles that will help guide the work under the Settlement Agreement. However, nothing in this Section is intended to change or modify the regulatory requirements for conducting an EE/CA analysis and developing and analyzing remedial alternatives under the NCP. New information may be learned or changed circumstances may lead to changes in the sequencing or the lead roles discussed below. Nothing discussed in Section 2 below creates a right or expectation that can be the subject of EPA enforcement or of dispute resolution under the Settlement Agreement.

2.1 General Project Area

As detailed in subsequent sections, the project area shall be determined in a series of evaluation steps that are intended to make the project area consistent with the Harbor-wide remediation. For discussion purposes, the general area under consideration for the Gasco sediments project is shown in Figure 1. Subareas of potential interest for the project in Figure 1 include areas where visible product is often but not always present (dark green), areas associated with bioassay toxicity (green), and areas above the Probable Effects Concentration (PEC; light green). There are no specific expectations with regard to remediation in any of these areas; rather, EPA and Respondents intend that remedial design for these areas will be consistent with the Harbor-wide Remedial Investigation and Feasibility Study (RI/FS) and Record of Decision (ROD), except as may otherwise be required under this SOW.

2.2 Programmatic Sequencing

The appropriate sequencing of remedial measures at the Gasco Sediments Site is critical to maximize the effectiveness of the overall Portland Harbor Superfund Site remedy and minimize the potential for recontamination. Four distinct phases of work under Oregon

Department of Environmental Quality (DEQ) and EPA direction are anticipated to occur in the following order (see Figure 2):

- Groundwater/Non-aqueous Phase Liquid (NAPL) Source Control (DEQ lead)
- Upland Remedial Action (DEQ lead)
- Gasco Sediments Site Final Sediment Remedy – Phased (EPA lead), design of which is the subject of this SOW
- Portland Harbor Remedy (EPA lead)

The groundwater/NAPL source control work needs to be completed first to prevent recontamination of any sediment remedy, and particularly sediment caps. Focused feasibility studies for the upland source control work have been completed, and a interim source control action is currently under design. The upland source controls will include a vertical barrier to NAPL migration and a groundwater extraction and treatment system. A NAPL extraction system may also be included in upland source controls, depending upon the findings of the planned NAPL Removal Pilot Program. These interim measures are expected to be part of an overall upland final remedy. Additional upland source control includes enhanced in-situ bioremediation for chlorinated volatile organic compound (CVOC) impacts in the Siltronic source area.

The Respondents will continue to work under DEQ oversight on upland source control actions related to the Gasco and Siltronic sites. The goal is for upland sources to be controlled to the greatest extent practicable before or during Site remedy implementation such that post remedy recontamination is not predicted and that in-water RAOs can be achieved.

The Gasco upland remedial investigation and risk assessment reports are currently being reviewed by DEQ and the upland feasibility study is in the preliminary planning phase. The upland feasibility study shall include evaluations of technologies and remedial alternatives to address upland soils, NAPL, groundwater, and stormwater. The remedial actions selected will be integrated with the Source Controls discussed above into an overall permanent remedy addressing all matrices and pathways posing risk at the Gasco and Siltronic upland sites. The goal is to implement the upland work prior to placement of the final Gasco sediment caps and dredge covers.

The Siltronic Focused Feasibility Study (FFS) for groundwater and transition zone water (TZW) impacted by CVOCs has been reviewed by DEQ (the supporting remedial investigation is still under review). It is Siltronic's goal that upland source controls for MGP-related groundwater and NAPL impacts will also, along with Siltronic's source area enhanced in-situ bioremediation, provide source control for the CVOC groundwater plume.

In the past, for the purpose of defining DEQ versus EPA-led work, the ordinary low water (OLW) line has generally been used at this site. Thus, remedial work in river bank soils above the OLW line is currently being evaluated in coordination with DEQ. For project-specific reasons, riverbank remediation construction will take place simultaneous with the Gasco Sediments Site construction so that a continuous fully integrated slope from Ordinary High Water (OHW) to permanently submerged sediments consistent with both riverbank and sediment designs can be constructed at one time with one set of river water quality protection measures. As such, for purposes of planning and efficiency, EPA shall oversee both the sediment construction and riverbank remediation work (top of bank riverward) as part of this SOW. EPA oversight of sediment construction and riverbank remediation work will: 1) extend from the river sediments up to the top of the bank slope ending where the generally level portions of the site begin; 2) result in a continuous fully integrated slope from the top of the riverbank to permanently submerged sediments; and 3) be constructed at one time with one set of river water quality protection measures consistent with both riverbank and sediment designs. The combined riverbank and sediment work will include one comprehensive ESA evaluation in consultation with NMFS (i.e., one biological assessment) that will cover both the sediments and riverbank removal or remediation work up to the top of the bank. The design will include evaluation of removal of sediments underlying the sloping portion of the bank, also known as the "wedge" area. In the event Gasco sediments construction does not proceed in a timely manner, the SOW does not limit DEQ's authority to include riverbank remediation in the uplands FS.

The Portland Harbor Remedial Investigation (RI) is almost complete and the and the Feasibility Study (FS) phase is beginning. A proposed final Gasco Sediments Site remedial

alternative shall be prepared so that it can be described in EPA's Proposed Plan for Portland Harbor. The Proposed Plan will describe the recommended Harbor-wide remedy and is subject to public comment and review. After public comment, the remedy decision will be documented in the ROD for the Portland Harbor Superfund site. Once the ROD is completed, further source control work will continue, and the remedial design and remedial action phase of work for Portland Harbor will start. One goal of this SOW is that the Gasco Sediments Site design shall be complete and ready for construction as the first or one of the first in a series of final sediment remedial actions throughout the Harbor. EPA retains its authorities to order work as a removal or remedial action.

The Gasco Sediments Site design will rely on the harbor-wide risk and FS information as it becomes available to develop a Gasco design that is consistent and fully integrated with the Harbor-wide remedy. Consequently, key points of information feed back between the harbor-wide process and Gasco Sediments Site action include:

- The harbor Draft Baseline Risk Assessment (BLRA) will be used to refine the Gasco Sediments Site cleanup areas for the Gasco EE/CA
- The harbor Draft FS, including remedial action objectives and preliminary remediation goals, will be used to develop the Gasco Sediments Site preliminary design alternative.

2.3 Risk Management Framework

This SOW's goal is to design a remedy consistent with the ROD that will reduce key human and ecological risks cost effectively given Site characteristics, which results in a cleanup that is protective of public health and the environment and meets all federal and state applicable and relevant and appropriate requirements (ARARs). The risk lines of evidence used in the ROD will guide risk management for the Gasco Sediments Site. The design will also use a risk management framework consistent with EPA guidance (EPA 2005 and EPA 1988) on developing sediment remedies and specifically recognizes the risk management goals for the project throughout the evaluation and design process. The risk management related approaches that are specifically important to this project and are consistent with guidance include:

- The Gasco Sediments Site clean up boundary will be consistent with Portland Harbor EPA approved BLRA.
- Evaluate remedial alternatives with regard to total net risk reduction within the overall framework of the NCP remedy selection criteria.
- Use the Portland Harbor risk assessment protocols, procedures, data, and outcomes whenever possible to set clean up boundaries and evaluate risk reduction, unless use of these would cause an unacceptable delay to the Gasco Sediments Site remediation.
- Evaluate alternatives for long term effectiveness for a range of technologies including dredging, capping, and Monitored Natural Recovery (MNR).[2] Alternatives will include combinations of technologies that are tailored to the physical, chemical and other conditions of the Site.
- Evaluate the short term risks (i.e., sediment resuspension, water borne releases, and dredge residuals) posed by different dredge methods (i.e., hydraulic and clam shell) and the installation and removal of various containment systems (i.e., sheet pile and coffer dam).
- Because the level of some of the risk is related to biota exposures, evaluate migration pathways, bioavailability, and future exposure (e.g., sediment stability under various river current and vessel propeller scour conditions) when predicting risk reduction.
- Evaluate future exposures and risks potentially posed by the presence of potentially mobile product in sediment.
- Preference for removal of "substantial product" as defined in Section 3.6.2.1 of this SOW from the project area for offsite disposal, where consistent with the other risk management framework approaches.

Remedial alternatives analysis will be conducted using the 9- criteria contained in the NCP in the EE/CA analysis. Some of the issues, but not all, that will be considered in developing the remedial alternatives are:

- Slope stability issues
- Variations in physical conditions from shorelines to deep navigation channels

[2] It should be noted that MNR refers to known, ongoing, naturally occurring processes to contain, destroy, or otherwise reduce the bioavailability or toxicity of contaminants in sediment. MNR for sediment includes solids and dissolved phase changes in concentrations over time (e.g., bulk sediment and TZW or porewater). In relation to groundwater or in-river TZW this process is sometimes referred to as attenuation.

- Construction will need to take place in and around existing operating docks
- Neighboring future water dependent uses such as U.S. Moorings' docks and Siltronic's process water discharge outfall, including the potential need for temporary outfall relocation during construction and replacement
- Accommodating FAMM/Koppers dock usage during construction
- Flood impacts and floodway analyses relative to potential alternatives
- Substantive requirements of the Endangered Species Act (ESA), Clean Water Act, other Applicable or Relevant and Appropriate Requirements (ARARs), etc.
- Navigation requirements including federal navigation channel issues and private future navigation requirements for transport and docking
- Overlap and integration of riverbank source control measures and remedial actions

Dock removal is not preferred by NW Natural under this SOW due to its impacts on business operations, and this option is not expected to be cost-effective as defined and evaluated consistent with the EE/CA process. However, the cost effectiveness of potential dock removal and/or limiting dock usage during construction will be fully evaluated and considered in the project EE/CA. This will include evaluation of alternatives that consider the full costs of dock replacement, potential limits on dock usage, and the costs of lost business resulting from those alternatives. Also, the EE/CA will include a comparison of the short term and long term effectiveness of remedial alternatives that include dock removal or limited usage to those that do not.

3 WORK TO BE PERFORMED

This section describes the work to be performed under the Settlement Agreement as well as RAOs, key decision factors, and criteria that will govern project work.

3.1 Ongoing Coordination

The Respondents shall coordinate meetings and/or teleconferences with EPA, DEQ, the Tribes, and the Natural Resource Trustees to discuss the status of work described in this SOW. After approval of the Work Plan (see Section 3.3), such meetings shall be monthly, if needed. DEQ, the Tribes, and the Trustees will submit their comments to EPA. EPA will provide the comments to Respondents that Respondents are to address. To coordinate with upland source control actions on the Gasco and Siltronic sites, the Respondents shall coordinate quarterly meetings with EPA and DEQ and/or written updates shall be provided in place of such meetings. Consistent with the February 2001 Memorandum of Understanding, DEQ will provide upland source control documents to EPA for review, to ensure consistency and compatibility with the contemplated in water dredging and cap designs for recontamination analysis.

3.2 Remedial Action Objectives (RAOs)

Because the goal of this project is to design a final remedial alternative that can be included in the Portland Harbor Proposed Plan, the RAOs shall be consistent with the RAOs being used for the wider Portland Harbor site. Consistent with current Portland Harbor RAOs, the project action objectives for final remedial design at the in-water portion of the Gasco site are:

1. Removal of sediments containing substantial amounts of product (e.g., solid "tar" and/or NAPL) that may serve as potential future source of risk material, unless it can be shown that the costs of such removal are clearly disproportionate to the degree of risk reduction to be attained through physical removal as compared to other remedial options for the same material. "Substantial" is defined in Section 3.6.2.1 of this SOW.
2. Reduce human health risks to acceptable levels from direct contact with and incidental ingestion of chemicals of concern (COCs) in Site sediments.

3. Reduce COC concentrations in Site sediments to levels that would result in acceptable risks to humans that eat fish and shellfish from the harbor in the absence of other sources of chemicals in the river.
4. Reduce COC fluxes from Site sediments such that human health risks would be at acceptable levels for direct contact with and incidental ingestion of Site surface water in the absence of other sources of chemicals in the river.
5. Reduce ecological risks to acceptable levels from contact with and ingestion of COCs in Site sediments or prey from the Site in the absence of other sources in the river.
6. Reduce COC fluxes from Site sediments such that ecological risks would be at acceptable levels for direct contact with and ingestion of Site surface water in the absence of other sources of chemicals in the river.
7. Reduce the migration of contaminants at unacceptable levels from the Site to the Willamette River.
8. Reduce COC fluxes through Site sediments so that recontamination of Site sediments to unacceptable levels does not occur.

Definitions of terms such as "reduce risks" and "acceptable levels" shall be consistent with the Portland Harbor RI/FS Work Plan or as modified by the harbor-wide RI/FS process. Likewise, if through the RI/FS process, the RAOs for the Portland Harbor site are changed or revised, RAOs for this project shall be revised. Chemicals of Concern (COCs) are defined as those chemicals related to historical and present Site sources that are found to pose risk at the Site following methods consistent with the Portland Harbor BLRA. The final Portland Harbor ROD will select performance standards and cleanup levels based on protectiveness and compliance with applicable and relevant and appropriate requirements (ARARs).

The Portland Harbor FS will consider "background" following EPA guidance (EPA 2002a) on the use of background in RI/FS evaluations and other relevant EPA Superfund guidance.

Removal of significant amounts of product in sediment is expected to minimize the potential risks over the long term as described by RAO #1. However, it should be noted that removal of all product in sediments is not necessary to meet this objective and may not be technically feasible given practical limitations of sediment removal, which will be further evaluated as described in 3.6.2.1. None of the above precludes the evaluation or selection in

the EE/CA of removal options for sediments that do not contain substantial amounts of product. Removal may be a cost effective alternative (as determined in the EE/CA) for various types of Site sediments.

RAO #7 and 8 relate to preventing recontamination of the Site from upland or other sources. In addition, it should be recognized that recontamination from potential harbor wide sources must also be evaluated in the project EE/CA and design documents. These potential sources include ongoing upland sources from other upstream and nearby sites as well as potential sources from upstream sediment remediation (particularly dredging) projects. The EE/CA and design documents will address the appropriate sequencing of Site construction and Gasco and Siltronic source control activities with these potential harbor-wide sources such that recontamination of the Site remedy is prevented. Such sequencing will be consistent with the findings of the Portland Harbor FS, Proposed Plan, and ROD, to the extent possible, recognizing that the Gasco Sediments Site represents a potential recontamination risk to other downstream sites. Cleanup alternatives may include sequencing Site construction in whole or part, dredging earlier and waiting to place a permanent cap, or other sequencing to prevent recontamination consistent with upstream and nearby source controls and sediment remediation timelines. Such sequencing will be consistent with the findings of the Portland Harbor FS, Proposed Plan, and ROD to the extent this is available in a timely fashion. EPA will oversee both the sediment and riverbank work as part of this SOW with riverbank work being defined as the bank area up to the top of the bank slope and ending where the generally level portions of the site begin. This work shall include evaluation of removal of sediments underlying the sloping portion of the bank, also known as the "wedge" area.

The above RAOs shall apply within the boundary determined for the project. Establishment of that boundary within the wider Portland Harbor sediment cleanup is discussed more in Section 3.6.2.9.

3.3 Work Plan

The Work Plan shall be submitted in accordance with the schedule contained in Section 4.

The Work Plan shall provide a more detailed description of work to be conducted for the project consistent with this SOW. The Work Plan shall contain at a minimum the following information:

- Introduction/Purpose
- A review and presentation of existing information (as detailed more below)
- A summary of each of the work tasks consistent with this SOW
- Procedures to protect and address cultural resources consistent with the cultural resources surveys conducted for the Harbor by the Lower Willamette Group (LWG) and for the Gasco site specifically by NW Natural for the previous tar removal action conducted in 2005
- A description of the analysis to be conducted to determine disposal facility or containment options for contaminated sediment
- Increased specificity of the Section 3.2 RAOs, if needed. This will include any necessary refinement of project action objectives stated in Section 3.2. The intent is that the objectives in Section 3.2 shall govern the work, so minimal refinement is expected and shall focus on the addition of means and methods of RAO measurement, as needed.
- Identification of potential Applicable or Relevant and Appropriate Requirements (ARARs), and To Be Considered (TBCs) for the Site
- A schedule for completion of all project tasks per Section 4, with additional details as needed to describe the work timeline
- A process and schedule showing how these SOW tasks fit into the upland source control program such that the sequence of activities discussed in Section 2.1 shall be achieved
- Other information (including maps and figures) necessary to gain a general understanding of the Site.

The Work Plan shall also outline the process for engaging partner agencies on a timely basis to ensure that substantive requirements are met consistent with partner agency interpretation of those requirements. Of particular importance is Endangered Species Act (ESA) compliance with National Marine Fisheries Service (NMFS). The Work Plan shall address key points for engaging NMFS on detailed reviews of project material including:

- Immediately prior to EE/CA development

- EE/CA review including specific input on the evaluation and selection of preferred alternative and a Biological Assessment (BA) of the preferred alternative
- Preliminary Design review including a revised Biological Assessment (BA) based on EE/CA level BA comments
- Interim Design review including any updates to BA determinations as appropriate.

The Work Plan description of existing information will not be a comprehensive data report, and it will rely on original reports from LWG, Siltronic and NW Natural for detailed information, as needed to conduct investigations and design. Important figures, tables, and overall data summaries shall be included in the Work Plan as necessary to illustrate known information and data gaps. The existing information description shall include:

- Brief description of the Site characteristics, including ecological and physical characteristics as well as human land use (e.g., any recreational and/or transient use of beaches).
- Summary of historical and ongoing sources of contamination to the Site, including past and present operations, drainage, discharges, groundwater plumes, groundwater seeps, or other releases.
- Summary of existing information on upstream and upland contamination sources that have the potential to contaminate the Site, including a description of environmental investigations, environmental cleanups and planned upland source control measures that are being conducted under agreements with DEQ as the lead agency. The summary of upland source control measures being conducted shall contain the most recent version of the schedule for implementation and completion as negotiated by DEQ and NW Natural and Siltronic.
- Summary of site historical information including dredging history and identification of past and present property owners, operators, and major tenants as well as owners and operators of all immediately adjacent upland properties.
- Summary of current facility operations and potential access or operational constraints on Work Plan implementation.
- Summary of nature and extent of contamination, sediment toxicity testing, and biota sampling at the Site, to the extent known, including chemical/toxicity information relevant to the remedy. This will be an initial summary, and more detailed mapping including comparison to screening levels shall be conducted for the Project Area

Identification and Data Gaps QAPP discussed in Section 3.4. Existing chemistry data will be reviewed to establish Category 1 and Category 2 data categories in accordance with the Portland Harbor RI/FS protocols.

- A conceptual site model showing the relationship of the contaminant plumes starting in the uplands and continuing through the riverbank, and into sediment in the river, to the full extent of the data available at the time of submittal. This shall include mapping of VOCs associated with Siltronic soil, groundwater, and sediment impacts and overlap with MGP related soil, groundwater, and sediment impacts.
- Upon request by EPA, Respondents shall also submit copies of previous studies or sampling efforts conducted independently or under local, state or other federal authorities or agreements that are determined by EPA to relate to remedy selection under the Settlement Agreement.

The COCs to be reviewed and mapped in existing information summaries and conceptual site models for the Work Plan shall be based on the COC lists for upland Gasco and Siltronic site source controls as well as those chemicals currently being identified as COCs for this region of the Harbor for the harbor BLRA. The BLRA COC list for this region of the harbor shall be refined during the course of the Gasco Sediments Site work. Based on the current status of this work and upland Gasco and Siltronic source control COC lists, COCs to be reviewed and mapped in the Work Plan are currently expected to include:

- Benzene, toluene, ethylbenzene, xylenes (BTEX)
- Polynuclear Aromatic Hydrocarbons (PAHs)), extended to include 2-methylnaphthalene, dibenzofuran, and carbazole
- Cyanide (including total cyanide in sediment and total, available, and free forms in water samples)
- Zinc
- Trichloroethene (TCE)
- Cis-1,2-Dichloroethylene (cis-DCE)
- Trans- 1,2 Dichloroethylene (trans-DCE)
- 1,1 Dichloroethylene (1,1-DCE)
- Vinyl chloride
- PCBs

- DDTs
- DDDs
- DDEs
- Diesel range hydrocarbons
- Residual range hydrocarbons
- BHCs
- Endrin Ketone

This nature and extent mapping shall also include mapping of product observations including tars and oils. Conceptual site model plume mapping shall be limited to a subset of COCs that represent the greatest risks and/or extent of chemicals associated with the Gasco Sediments Site. A rationale for selecting this subset of COCs for conceptual site model mapping shall be presented in the Work Plan based on this existing chemistry data review. While only COCs posing the greatest risk will be depicted in the work plan, for the purposes of performance standards measurement later in the cleanup process, the full list of COCs shall be utilized.

3.4 Project Area Identification Report and Data Gaps QAPP

The Project Area Identification Report (AIR) and Data Gaps Quality Assurance Project Plan (QAPP) shall be submitted to EPA in accordance with the schedule contained in Section 4. The purpose of this document is to build upon the existing information summary in the Work Plan to:

- set the project boundaries based on a risk framework consistent with the Portland Harbor RI/FS process (Section 3.4.1)
- identify any data gaps (Section 3.4.2) relevant to refining project boundaries, conducting the EE/CA per Section 3.6, and conducting the Design per Section 3.7.
- describe field sampling, analytical, and quality control/quality assurance (QA/QC) procedures for filling identified data gaps (Section 3.4.3).

3.4.1 Project Area Identification

3.4.1.1 Overview of Iterative Project Area Identification Process

The project area shall be identified in an iterative fashion through the course of data gathering, alternatives evaluation, and design. The initial project area identification

shall be based on currently available lines of evidence from the Portland Harbor RI/FS and presented in the AIR. This version of the boundary will be used to help identify the preliminary lateral and vertical extent of the project cleanup area as well as data gaps.

An interim refined cleanup area identification shall be determined after the lines of evidence are finalized in the Portland Harbor RI and BLRA. The interim area shall be presented in the Gasco Sediments Site EE/CA following methods discussed in Section 3.6. This refined boundary shall be used to refine lateral and vertical extent for the evaluation of remedial alternatives. Internal subareas within the boundary will be considered to help in the identification of combination alternatives within the overall area (e.g., capping in one subarea vs. dredging in another subarea).

A proposed final project area shall be determined after the Portland Harbor FS is available and this proposed final area shall be presented in the Gasco Sediments Site Preliminary Design as described in Section 3.7. The proposed final project area boundary shall be used for the basis of remedial design and identified for inclusion in the EPA Portland Harbor Proposed Plan. The final ROD RAOs shall also apply to this proposed final project area.

Identification of a final project area under the Settlement Agreement and SOW may not represent the boundary where all releases of hazardous substances from the Gasco and Siltronic facilities have come to be located within the Portland Harbor Superfund Site. Additionally, the project area under this Settlement Agreement and SOW may not address all remedial actions determined to be necessary from releases from Gasco and Siltronic facilities in the ROD.

3.4.1.2 Initial Project Area Identification for the AIR

At the present time the Portland Harbor BLRA and FS are not completed and they will not be available at the expected time of the initial or interim Gasco AIR development. To help identify data gaps in the AIR, the following preliminary lines of evidence will be used to develop preliminary lateral and vertical extents for the cleanup:

- The lateral and vertical extent of significant volumes of NAPL and tar product in sediment.
- The use of currently available lines of evidence to evaluate where unacceptable risk exposure may be identified in the Portland Harbor ROD, but where significant volumes of NAPL and tar product are not present.
- The use of currently available lines of evidence for Portland Harbor baseline and/or background conditions.

Consistent with the available harbor BLRA lines of evidence the nature and extent of contamination shall be presented and mapped in the AIR. This summary of existing bulk sediment, TZW, riverbank soils, and water media chemistry shall be compared to ecological and human health screening levels consistent with the in-process harbor BLRA and RI/FS, including but not limited to:

1. Existing ecological sediment quality guidelines that are or will be used in the Portland Harbor BLRA that represent a range of levels including, but not limited to, low or no effects levels as well as levels at which some effects are expected.
2. Estimated sediment Preliminary Remediation Goals (PRGs) from the Portland Harbor RI/FS process for persistent bioaccumlative toxins (PBTs) that are protective of humans and wildlife that consume aquatic biota from the Willamette River
3. Estimated sediment PRGs from the Portland Harbor RI/FS process that are protective of humans from direct contact with and incidental ingestion of COCs in sediments.
4. Estimated water PRGs and screening levels from the Portland Harbor RI/FS that are protective of ecological receptors and human health from direct contact with and ingestion of water media. These include but are not limited to those values currently under consideration for Portland Harbor screening values including: human health and ecological ambient Water Quality Criteria (WQC), residential tapwater SLVs from EPA's Regional Screening Level Tables, and Drinking Water Maximum Contaminant Levels.
5. Conservative water screening levels or, if available, estimated PRGs or management goals from the Portland Harbor RI/FS that are protective of receptors related to groundwater plumes.

All screening values and estimated PRGs used shall be reviewed and approved by EPA before their use. Existing data should be plotted on site maps. Locations with concentrations above the screening levels and estimated PRGs identified above should be indicated on these maps.

It is fully recognized that this initial set of parameters will be used as a starting point for the later project area refinements for the EE/CA and final project area identification for the design. As additional information from the Portland Harbor RI/FS becomes available more detailed project area definition shall be conducted and the area, and any sub-areas within it, shall be refined.

3.4.1.3 River Bank Remedy and Source Control Areas and Volume Determination for AIR

The riverbank is included in the project area to facilitate consistencies between riverbank remediation, source control work and the in-river sediment cleanup. The need for riverbank work shall be determined by:

1. the need for soils remediation consistent with the upland risk assessment and upland FS
2. the need to control sources of contaminants from the riverbank to the river including
    a. processes of soil erosion,
    b. leaching of chemicals due to shallow groundwater movement through the bank,
    c. and/or stormwater infiltration and discharge through riverbank soils.

The process for determining the work needed in the river bank areas and volumes that are included in the project are described more in Section 3.6.2.10. For the preliminary determination of areas and volumes to be included in the AIR, existing data that extends landward up to (but not beyond) the top of bank (as defined in Section 2.2) shall be reviewed. This area shall also be included in the data gaps identification (Section 3.4.2). Any data or known determinations consistent with soil remediation and source control actions that extends landward of the top of bank

shall not be included in the AIR or subsequent EE/CA. Such data and activities will be included in the DEQ determinations for uplands source controls and remediation. Although this riverbank area will be included in the AIR there may not be a need for remediation or source controls along all portions of the riverbank. The areas of riverbank that require remediation or source controls shall be identified in the Interim Area Identification (Section 3.6.2) portion of the EE/CA and Data Report (Section 3.6).

The application of the in-river lines of evidence discussed in 3.4.1.2 were not developed for use in preliminary project area identification when applied to riverbank soils.

3.4.2 Identify Data Gaps

The AIR and Data Gaps QAPP shall review existing information used to define the project boundary per Section 3.4.1 and then identify any data gaps that shall be filled by the collection and analysis of field samples relevant to conducting the EE/CA per Section 3.6, conducting the Design per Section 3.7, and refining the project area boundary for both the EE/CA and Design per the iterative approach described in Section 3.4.1.1.

More specifically, data gap identification shall focus on problem definition and shall result in collection of data of adequate quality and technical content to:

- Determine spatial and volumetric extents of contamination
- Refine the project boundary
- Evaluate remedial alternatives on a consistent basis in the EE/CA
- Prepare project designs
- Evaluate potential human health and ecological risks consistent with the Portland Harbor BLRA lines of evidence resulting from exposure to sediment, transition zone water, riverbank, groundwater, surface water and biota contamination
- Evaluate recontamination potential to the Site by (1) riverbank and in water contaminated sediments and water media outside of the Site and (2) upland sources of contamination

- Determine engineering characteristics of the Site sediments including consistency, dredgeability, potential slope stability issues related to dredging, and potential sediment consolidation issues associated with capping
- Evaluate potential water quality effects associated with dredging, piling removal, sheet pile installation, capping, or disposal technologies
- Evaluate technologies for sediment remediation including capping, dredging, treatment, including any necessary treatability testing, and disposal (on-site and off-site)
- Evaluate technologies for TZW remediation
- Evaluate potential impacts to threatened or endangered species, other biological receptors, and the potential habitat benefits and impacts of the remedy.

Data gaps identification shall fully consider data collected by NWN and Siltronic in addition to evaluations conducted by the LWG for the Portland Harbor RI/FS, which will be particularly relevant to issues of contaminant levels in sediment, biota, surface water, and transition zone water; recontamination potential; sediment dredgeability and consolidation potential; water quality effects, treatability testing; and biological impacts.

Although the intent is to collect all data needed to complete the project, once the preferred alternative(s) is selected via the EE/CA, there may be a need for some additional specific data collection to support design work.

Although other data gaps may be eventually identified and all data needs are subject to confirmation in the data gaps analysis, based on preliminary reviews of existing data, it appears the following types of data needs could be identified:

- Given that substantial spatial gaps exist for existing sediment bioassay data in some potential project areas and sediment bioassays are a strong line of risk evidence, collection of additional sediment bioassay data to refine the project boundary in the iterative process discussed in Section 3.4.1.1.
- Bulk sediment chemistry would be needed at least at bioassay locations and may also be an independent data need to fill spatial or volume gaps.
- Coring for visual observations of NAPL/product in key areas to fill spatial or volume data gaps.

- Possible geotechnical or chemical mobility (e.g., leachate, elutriate, or other tests) testing to support EE/CA alternatives evaluation and/or design.

Another specific characterization data gap that shall be considered is the extent of existing chemistry information under the docks and the potential need for additional information there.

Because of the difficulty sampling under docks, this has generally not been undertaken by the LWG or NW Natural. Existing assumptions are that chemistry and product levels under the docks are similar to those areas immediately adjacent, which have been sampled on both the riverward and shoreward (i.e., behind the dock) sides of the docks. This assumption shall be further evaluated to determine the extent to which it might impact EE/CA decisions if it were wrong. Where it appears EE/CA decisions could be substantially altered (see below), there may be a need for select sampling underneath the dock to confirm/refute this assumption.

Defining spatial/volume data gaps shall not rely on any specific statistical or spatial evaluation techniques, although these may be considered. The overall objective driving spatial gap identification is whether or not inclusion of the additional spatial information could reasonably change the selection of the preferred alternative in the EE/CA. This can be gauged by estimating changes in defined areas and volumes (using methods defined in Section 3.4.1.1) that would be provided by additional data and relating those changes to general unit cost estimates (e.g., for dredging, capping, etc.).

3.4.3 Data Gaps QAPP

The procedures the Respondents plan to implement when conducting all field activities shall be detailed in the Data Gaps QAPP. The QAPP shall ensure that sample collection and analytical activities are conducted in accordance with technically acceptable protocols that data meet data quality objectives (DQOs). The QAPP provides DQOs and methods for meeting those objectives and contains a Field Sampling Plan (FSP), which describes procedures for planning and executing field activities. Respondent shall also prepare a HASP that is designed to protect personnel from physical, chemical and other hazards posed by field sampling efforts.

The Data Gaps QAPP shall define site-specific DQOs and detail methods and QA/QC procedures for collecting and analyzing samples needed to fill the data gaps identified through the process described in Section 3.4.2. The QAPP shall also describe the personnel, project organization, data handling, data validation, and database development procedures. The QAPP shall describe the quality assurance and quality control protocols necessary to achieve required data quality objectives. The QAPP shall be prepared in accordance with Section 3.9.

The Data Gaps FSP shall define in detail the sampling and data-gathering methods that will be used for the design characterization. It shall include sampling objectives, a detailed description of sampling activities, sample locations, sample analysis, sampling equipment and procedures, sampling schedule, station positioning, sample handling (e.g., sample containers and labels, sample preservation), and chain of custody procedures.

The Data Gaps HASP shall be prepared in accordance with Section 3.9.

3.5 Data Collection and Reporting

Data shall be collected and reported consistent with the AIR and Data Gaps QAPP described in Section 3.4.3. The data collection, analyses, data validation, database development shall be conducted per the schedule in Section 4. Data shall be reported in the EE/CA.

Upon request by EPA, EPA or its authorized representatives may take split and/or duplicate samples. Respondents shall notify EPA not less than 14 days in advance of any sample collection activity, unless shorter notice is agreed to by EPA. EPA may take any additional samples that EPA deems necessary. Upon request, EPA will allow Respondents to take split or duplicate samples of any samples EPA takes as part of its oversight.

3.6 EE/CA and Data Report

The EE/CA and Data Report shall be submitted in accordance with the schedule contained in Section 4. This report shall contain an evaluation of potential cleanup alternatives

consistent with EPA guidance on EE/CAs. The EE/CA shall include a development and evaluation of alternatives as well as a thorough evaluation of all criteria considered under an FS. This is consistent with the goal of including the preferred alternative design in the Portland Harbor Proposed Plan. Based on data obtained in the previous sampling efforts and work to be performed under this SOW, and in consideration of EPA's guidance for RI/FS and EE/CAs, Respondents shall prepare a technical briefing for EPA, DEQ, the Tribes and the Trustees on the proposed removal alternatives that will be presented by Respondents in the EE/CA. After the technical briefing, Respondents, in consideration of comments received at the technical briefing, shall submit a first draft of the EE/CA.

If the Portland Harbor RI/FS and Proposed Plan process is sufficiently on schedule to meet the desired sequence of activities as discussed in Section 2.1 and shown in Section 4, then public comment on the Site remedy will occur as part of the Portland Harbor Proposed Plan public comment process. Given the currently envisioned schedule, information from the Site remedy could be incorporated into the Proposed Plan at a design level of detail (either interim or final design depending on the exact timing of the Proposed Plan).

If the Proposed Plan is not ready within a reasonable time following preliminary approval of the EE/CA, then the preliminarily approved version of the EE/CA may be released by EPA for a formal public comment period. Under this scenario, a public comment period of at least thirty (30) days would be required for the EE/CA and the administrative record.

Under either public comment process, Respondents shall assist EPA, as requested, before and during the comment period with its community relations activities concerning the EE/CA or harbor Proposed Plan, as it specifically relates to issues on this Site. Respondents shall also assist EPA in compiling the Administrative Record before and during the public comment period. If, based on public comments received, EPA determines additional data or analyses are required to complete the Site remedy EE/CA or design, Respondents shall collect such data, or perform such analyses, as determined necessary by EPA.

3.6.1 Contents

The EE/CA shall contain the following:

- Executive Summary

- Introduction
- A project area characterization including Interim Project Area Identification (as detailed in Section 3.6.2), which shall be a refinement of the AIR based upon the data gaps information collected per Section 3.5 and the results of the Portland Harbor BLRA.
- The result of the analysis regarding the remedy recontamination potential of the Site by (1) riverbank and in water contaminated sediments and water media from outside of the Site and (2) upland sources of contamination including whether source control actions will be sufficient or if additional actions may be required to control potential sources of significant recontamination
- Identification of ARARs
- Procedures for addressing and protecting cultural resources during the Site remedy
- Refinement of RAOs, as necessary
- Identification, analysis, and screening of remedial technologies including water quality controls
- Assembly of screened technologies into combined cleanup alternatives
- Screening of combined cleanup alternatives
- Identification, analysis, and evaluation of combined remedial alternatives including:
    - the identification and analysis of disposal facility or containment options
    - incorporating the costs of any remedial action
    - any proposed institutional controls
    - detailed assessment of screened cleanup alternatives against evaluation criteria
    - Individual detailed evaluation of each alternative
    - Comparative detailed evaluation of alternatives
- Recommended remedial alternative(s), including the selection of any needed disposal facility
- An assessment of the residual risk anticipated after the remedial action implementation
- Schedule for recommended remedial action

- Preliminary drafts of the Biological Assessment (BA) and Clean Water Act analysis memorandum for the recommended remedial action alternative
- An Appendix that shall contain the formal data report for all the data collection in Section 3.4 including data evaluations and discussions that support EE/CA evaluations.

Disposal options for dredged material shall be limited to off-site disposal facilities. The type of facility shall be guided by testing procedures presented in Section 3.6.2.1. Per RAO #1 in Section 3.2, substantial product shall be removed unless it can be shown that the costs of such removal are clearly disproportionate to the degree of risk reduction to be attained through physical removal as compared to other remedial options for the same material.

The alternatives analysis shall consider the following evaluation criteria:

- Overall Protection of Human Health and the Environment
- Compliance with ARARs
- Long-Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility, or Volume Through Treatment
- Short-Term Effectiveness
- Implementability
- Cost

The additional criteria of State Acceptance and Community Acceptance are evaluated by EPA after the public comment period.

The alternatives development and evaluation process shall also consider the following technical issues:

- Shoreline slope stability limits
- Dock stability limits
- Measures that may need to be taken to remove material existing under the dock
- Dock access limitations as they relate to scheduling of work
- Navigation channel depths and requirements
- Other Navigation limitations and reasonably anticipated future site uses (e.g., dock access Koppers, FAMM, and US Moorings)

- Floodway evaluation and limitations.

3.6.2 Interim Project Area Identification

The Portland Harbor RI and Risk Assessment information, if approved by EPA, shall be used to refine the preliminary project area defined in the AIR into an interim project area for the purposes of the EE/CA as described in Section 3.4.1.1. Specific criteria based on the Portland Harbor risk information shall be used to develop the interim project area, and later the final project area for the design. This information shall also be used to identify the sub-areas to assist in evaluation of combination alternatives in the EE/CA. The expected risk information to be used in project boundary and sub-area refinement for the EE/CA is defined in the following subsections.

3.6.2.1 Substantial Presence of Product

Areas with substantial presence of product in sediments is a line of evidence related to potential mobility of chemicals in the future, and thus related to risks identified in the BLRA. Visual observations in sediment cores shall be the primary parameter used for this line of evidence. As noted above, the term "substantial" product is intended to 1) target product that is related to potential future mobility and 2) indicate a preference for removal as defined by RAO #1. The definition of substantial product does not include every incidence of product observation at the site. Based on core observations, the working definition of "substantial presence of product" is those sediments that meet the following criteria:

1. Bands of product, layers of product, "saturated" sediments, "stained" sediments, and/or seams of product that are greater than 2 inches thick.
2. Any layer or seam of product, regardless of thickness, that is clearly defined as liquid NAPL that is also mobile (i.e., "oozes" or "drips" out of the core during core observations).

Modifying factors to this definition are:

3. If top 5 ft of core has no substantial product under Criteria #1, then deeper product should be judged as "not substantial", even if relatively thick layers of product exist at greater depths.

4. If there are any seams of mobile liquid NAPL (not solid or semisolid tar) per Criteria #2 then this is substantial product regardless of depth and the characteristics of overlying sediments.

The following is NOT substantial product:

- Any layers of non-mobile product (i.e., bands, layers, saturated sediments, stained sediments) that are less than 2 inches thick.
- Petroleum odors that are not associated with visual evidence of product beyond sheens and blebs.
- Sheens that are not associated with more substantial visuals of product
- Isolated product blebs or spots not associated more substantial visuals of product

Criteria 3 shall consider whether the 5 feet of overlying relatively clean material includes any sediment that would be expected to be removed as part of Army Corps maintenance dredging in the navigation channel. If so, the 5 ft depth requirement should be judged from the depth to which maintenance dredging would occur. The edges of the area with "substantial presence of product" shall be defined by cores which do not contain substantial product. Examples of product containing cores that meet the definition of "substantial product" and examples of cores that do not meet this definition are shown in Figure 3.

Also, as noted in RAO #1 in Section 3.2 substantial product shall be removed unless it can be shown that the costs of such removal are clearly disproportionate to the degree of risk reduction to be attained through physical removal as compared to other remedial options for the same material. If substantial product will not be removed, it must be shown that alternative approaches are substantially less costly as well as equally if not more effective at meeting all of the other RAOs, particularly those that relate to creating acceptable sediment risk and preventing downstream migration of contaminants.

3.6.2.2 Benthic Toxicity Bioassays

Bioassay locations exhibiting toxicity shall be considered to be within the project boundary consistent with Portland Harbor criteria for evaluation of bioassays. Bioassay results shall be directly interpreted by sampling location to help define areas of sediments.

3.6.2.3 Benthic Toxicity Models

The models may provide sediment chemical concentrations at which benthic toxicity can occur that can be applied directly to project sediment chemistry data. Toxicity model definitions and sediment chemical thresholds defined by the Portland Harbor process shall be used.

3.6.2.4 Human Health Shellfish Consumption

The chemical concentrations in shellfish tissue expected to cause human health shellfish consumption risks shall be used in the Portland Harbor BLRA to back calculate target sediment concentrations via biota sediment accumulation factors (BSAFs). Areas above target sediment concentrations can be mapped based on these calculated sediment thresholds. A wide range of sediment thresholds are possible based on varying exposure scenarios (i.e., shellfish consumption rates), cancer risk levels, and BSAFs. The range of thresholds and a reasonable number of increments along that range will be mapped.

3.6.2.5 Human Health Direct Sediment Exposures

Sediment concentrations expected to cause direct contact human health risks shall be determined for the BLRA and can be directly used to determine sediment areas posing risk via this pathway.

3.6.2.6 Sediment Probable Effects Concentrations (PECs)

These existing sediment guidelines shall be used in the BLRA and can be applied directly to Gasco sediment data to map sediment areas associated with potential benthic risks.

3.6.2.7 Portland Harbor "Baseline" PAH Levels

This may be important to the determination of project boundary as it relates to some types of low level diffuse contamination occurring within and around the Site, but not necessarily related to the Site.

3.6.2.8 Groundwater Plume Concentrations

TZW concentrations in groundwater plume areas shall be screened in the BLRA against water quality criteria and areas that exceed this screen or a similar screening conducted on more recent data may be included in the interim project area. When remedial action objectives and performance standards for groundwater plume areas are developed for the Harbor FS, these shall be used for interim project area identification.

3.6.2.9 Other Potential Lines of Evidence

Several lines of evidence are currently under consideration for the Portland Harbor BLRA process but their use has not been determined in that process. The findings of the Portland Harbor Round 2 Report and current expectations for the BLRA are that Polyaromatic Hydrocarbons (PAHs) and Volatile Organic Compounds (VOCs) do not cause substantial risks in fish consumption pathways. In the event that this finding changes with the completion of the BLRA, this line of evidence may be revisited to refine the project boundaries for the EE/CA.

Lines of evidence shall be evaluated in a manner consistent with the Harbor-wide process.

3.6.2.10 Riverbank Remedy and Source Control Determination

As discussed in Section 3.4.1.3, riverbank soils shall be included in the project area definition to the extent that river bank soils require remediation consistent with the uplands risk assessment and uplands FS and/or require control of sources from river bank soils to the river. In addition, where the need for such actions extends landward of the top of bank as defined in Section 2.2, these actions shall be included in the DEQ determinations for uplands source controls and remediation and not included in the sediment interim project area definition or subsequent sediment

EE/CA evaluations or design. Sediment based risk measures otherwise described in Section 3.6.2 are not appropriate for application to river bank soils.

The following remedial approaches are expected to be preferred to address each of the upland remedial and riverbank source control needs discussed in Section 3.4.1.3, although other remedial approaches may be evaluated in the EE/CA:

1. Combinations of removal and capping for areas requiring soil remediation.

2a. Stabilization for areas requiring control of soil erosion source control

2b. Control and/or diversion of shallow groundwater from entering the riverbank for areas requiring groundwater source control

2c. Capping of the bank with an impermeable surface for areas requiring stormwater infiltration source controls.

In each case, identification of areas requiring these actions shall be made entirely consistent with an upland remedial and source control approach as defined at the time of the EE/CA development.

Where multiple issues exist for a particular river bank segment, the overall remedy would include multiple measures that address each issue (e.g., capping for stormwater control, new armoring for erosion control, and a shallow collection trench for groundwater control).

The following criteria shall be used to determine the need for, areas of, and design of, riverbank remedy and source controls:

1. If substantial product is identified in riverbank cores and is contiguous with sediment substantial product (as indicated by sediment cores), the volume of riverbank soils that shall be removed if feasible will extend landward into the riverbank until contiguous product has been removed or a vertical line drawn from the top of the bank (as defined in Section 2.2) is reached. Some product may not be removed because the vertical line at the top of bank is reached, the product extends too deep to be integrated into the sediments dredge prism, or for other feasibility reasons. In these cases, the remaining product shall be capped using an engineered system that reduces potential

contaminant flux and product seepage to acceptable levels consistent with the design approach typically used for a sediment cap.

2a. If a riverbank segment is identified as unstable and contributing to substantial erosion of soils and that DEQ determines presents an ongoing source, the segment shall be stabilized and controlled as noted above.

2b. If a riverbank segment that contains contaminated soils[3] is identified that is subject to shallow groundwater infiltration and that DEQ determines presents an ongoing source that is not already controlled by ongoing upland groundwater source controls, additional control measures as noted above shall be identified.

2c. If a riverbank segment that contains contaminated soils is identified and that DEQ determines presents and ongoing source that is not controlled by ongoing upland source control measures, additional control measures as noted above shall be identified.

In addition to the specific criteria noted above, riverbank slope soils may need to be regraded to achieve stable slopes that can be integrated into the sediments dredge prism. This may include bank areas that do not contain contiguous substantial product or otherwise require source control measures. Such regraded areas shall not be required to meet any of the criteria of removal or source controls as outlined above, but shall include measures to ensure that stable riverbank slopes are constructed.

Riverbank areas on the Siltronic property shall be included in riverbank remediation efforts to the extent that they are adjacent to the sediments remediation area. These riverbanks shall be included in the remediation where they fall within Criterion 1 above or otherwise need to be re-graded to achieve stable slopes that can be integrated into the sediments dredge prism. These Siltronic riverbank areas will not be evaluated relative to source control Criteria 2a, 2b, and 2c above and source controls for Siltronic riverbanks are not included in this SOW. Source controls for Siltronic riverbanks will be evaluated under DEQ oversight.

[3] Contaminated soils will be defined consistent with upland remedy and source control approach (soil PRGs or equivalent).

3.6.2.11 Determination of Areas and Volumes

All of the lines of evidence will generate information that can be used to map areas associated with risk on a station-by-station basis either directly (e.g., observations of product in cores and bioassays) or via extrapolated sediment and/or TZW concentrations (e.g., benthic toxicity model, human health shellfish consumption, and other thresholds), which are equivalent to Preliminary Remediation Goals (PRGs). This information will be mapped using simple spatial approaches, rather than complex geostatistical techniques that may take additional time to negotiate and determine.

Each individual line of evidence discussed above (i.e., presence of substantial product, benthic toxicity bioassays, benthic toxicity models, human health shellfish consumption, human health direct sediment exposures, PECs (and/or sediment values that are protective of benthic macroinvertebrates), baseline levels, and TZW related concentration thresholds) shall be individually mapped and then combined in GIS "overlays" to define the project boundary. Consideration shall be given to the relative weights of each line of evidence. In general, areas that appear to pose risk based on stronger lines of evidence or where multiple lines of evidence overlap shall guide boundary delineation. EPA shall approve (through the Harborwide RI/FS process) relative weights of various lines of evidence for ecological risk as well as the approach for human health evaluation.

Sediment volumes shall be determined in a similar manner, by applying information directly (e.g., product observations in cores) or use of sediment chemistry thresholds. It is important to note that determination of these volumes does not necessarily imply a current or ongoing risk with these buried sediments given that they may be isolated and not available for ongoing exposures to people or ecological receptors.

As discussed in Section 3.4.1.1 the interim project area for the EE/CA shall be later refined for the preliminary design based on the findings of the Harbor FS and eventually shall be included in the EPA Proposed Plan for the Harbor.

3.6.3 Key Technical Issues

Several key technical issues shall be addressed by the EE/CA as noted in the following subsections.

3.6.3.1 Material Disposal Requirements

The EE/CA shall include development of disposal requirements for dredged sediment. While this is not a final determination, these requirements are expected to include:

- A method to determine whether any removed materials are or contain a RCRA hazardous waste ("Hazardous Wastes") or should be specially managed as a non-hazardous waste (e.g., disposed at a Subtitle C facility as a non-hazardous waste) ("Special Wastes"), specifically:
  - Evaluation of TCE, cis-DCE, trans-DCE, 1,1-DCE, and vinyl chloride concentrations to determine whether dredged sediments contain F002 waste.
  - Use of TCLP criteria for MGP-related constituents (e.g., benzene, phenols, chromium, and lead).
- A process for testing removed materials to determine whether the materials are Hazardous Wastes or Special Wastes.
- A health and safety process to control worker exposures to the material during the entire removal, handling, treatment (if necessary), transport, and disposal procedure that is consistent with waste determinations.

Hazardous Wastes shall be transported to and disposed of at an appropriate Subtitle C facility. Special Wastes shall be disposed of at a Subtitle C facility as non-hazardous waste.

Materials that are neither Hazardous Waste nor Special Waste ("Cleanup Materials") may be transported to and disposed of at a Subtitle D landfill, but only if it holds a permit by the State allowing the facility to accept such material. EPA and Respondents acknowledge that, to protect groundwater, OAR 340-093-0170(3)(d) requires an Oregon solid waste landfill receiving cleanup materials contaminated by hazardous substances to develop a "special waste management plan" for the landfill

approved by DEQ allowing the landfill to accept such material. Handling of remediation wastes at the site is described below and shall be more fully detailed in the EE/CA.

Determination Method

The method for characterizing dredged material as a Hazardous Waste or a Special Waste is described below.

The method to determine that MGP-related material should be managed as a Special Waste shall be based on the absence of TCE and associated CVOC chemicals and exceedance of TCLP criteria for any MGP-related constituent. If TCLP criteria are exceeded at the time the material leaves the Site, then the material shall be designated Special Waste and transported to a Subtitle C facility. If not, the material would be disposed of as Cleanup Material at a Subtitle D facility that meets the requirements described above. This method applies to both untreated and post treatment materials, if treatment is proposed. Consequently, an untreated material may meet this definition, but, upon treatment may be determined to no longer meet this definition. In the event that treatment, including treatment in barges, changes the definition, the material would no longer be designated a Special Waste.

The method to determine that sediments impacted only by TCE and associated CVOC chemicals contain F002 Hazardous Waste shall be based on concentrations of TCE, cis-DCE, trans-DCE, 1,1-DCE, and vinyl chloride that exceed DEQ-approved risk-based concentrations (RBCs) to be developed for incidental ingestion, dermal contact and inhalation by landfill workers. If TCE, 1,1-DCE or vinyl chloride are detected in dredged material at concentrations below these RBCs but the material exceeds TCLP criteria for TCE, 1,1-DCE or vinyl chloride, the material shall be designated as a characteristic Hazardous Waste. This method applies to both untreated and post treatment materials. If following treatment, including treatment in barges, the material no longer exceeds the RBCs or the TCLP criteria for TCE and associated CVOCs, the material would be determined not to contain F002 Hazardous Waste and not to be a characteristic Hazardous Waste. If the material is determined to contain F002 Hazardous Waste or to be a characteristic Hazardous Waste because

of TCE and associated CVOCs it would be disposed of at a Subtitle C facility. If not, the material would be disposed of as Cleanup Material at a Subtitle D facility that meets the requirements described above.

It is specifically recognized that commingling of TCE and associated CVOC chemicals with MGP-related constituents and materials occurs at the Site. Therefore, three scenarios are possible:

1. If it is determined that the concentrations of TCE, cis-DCE, trans-DCE, 1,1-DCE, or vinyl chloride in the commingled material exceed DEQ-approved RBCs developed for the landfill exposure scenario, the material shall be designated as and disposed of as F002 HazardousWaste.
2. If it is determined that TCE, 1,1-DCE, or vinyl chloride exceed TCLP criteria, the commingled material shall be designated and managed as Characteristic Hazardous Waste. If it is determined that one or more MGP-related constituents exceed TCLP criteria, the commingled material shall be designated and managed in accordance with applicable state hazardous waste laws.
3. If it is determined that the commingled material is not F002 Hazardous Waste and not a characteristic Hazardous Waste, then the material would be managed as cleanup material.

In addition, exceedance of TCLP criteria for any chemical other than those associated with MGP-related material or TCE and associated CVOCs, would result in the material being designated characteristic Hazardous Waste.

Also, if material containing either type of chemicals meets the following additional definitions of characteristic waste, then it shall be designated and disposed of as a characteristic Hazardous Waste:

- Ignitability – Ignitable wastes are those that can create fires under certain conditions, are spontaneously combustible, or have a flash point less than 60 °C (140 °F) as defined in 40 CFR §261.21.

- Corrosivity – Corrosive wastes are acids or bases (pH less than or equal to 2, or greater than or equal to 12.5) that are capable of corroding metal containers as defined in 40 CFR §261.22 .
- Reactivity – Reactive wastes are unstable under "normal" conditions. They can cause explosions, toxic fumes, gases, or vapors when heated, compressed, or mixed with water as defined in 40 CFR §261.23.

Testing Process

The sediments and related materials shall be sampled and tested during the data gaps sampling (Section 3.4) per the above methods to determine their designation as Hazardous Waste, Special Waste, or Cleanup Materials. The sediments within the project boundary shall be delineated into management units. Management units shall be defined as the smallest volume of sediment that:

1. can be reasonably separated and handled during construction as a discreet unit (e.g., a barge load, although larger volumes may meet this definition too).
2. can have a single representative composite sample that can be expected to reasonably represent that unit.

Management units shall be consistent with procedures in the *Northwest Regional Sediment Evaluation Framework (*SEF*)*(Interim Final, September 2006), which defines the smallest reasonable unit as 5,000 to 10,000 cubic yards, depending on sediment homogeneity. Specifically, each unit shall be sampled for disposal characterization prior to dredging by taking three cores within the unit (consistent with the SEF) that will be composited into a single sample. If appropriate, the composite sample may be split and some of the subsamples may be bench scale treated before testing. The number of subsamples would be determined by the number of treatment methods or options under consideration. These subsamples shall then be tested per the method described above.

In addition, confirmatory testing shall be conducted during construction. The testing shall be tiered and phased to minimize the potential for construction delays, while ensuring that appropriate disposal determinations have been made based on the pre-construction testing described above. The tiers of testing shall be:

- Tier 1. The first three barge loads will be tested by obtaining representative subsamples during the barge loading and combining them into a composite sample. The exact number of and method off obtaining samples will be detailed in the design documents. Each of these three samples will be analyzed per the methods described above on a quick turn around and results evaluated. If results are consistent with the pre-testing determinations for these management units and with EPA approval, one in every 10 subsequent barge loads will be tested in a similar manner.
- Tier 2. If the results of the next three tested barge loads (i.e., one in every ten barge loads tested after a total of 30 barge loads have gone to disposal) are consistent with pre-testing determinations for these management units and with EPA approval, one in 20 subsequent barge loads will be tested in a similar manner.
- Tier 3. Continue testing 1 in 20 barge loads unless results are inconsistent with pre-testing determinations for the unit in question.

If at any Tier of testing, results are inconsistent with pre-testing determinations, then additional testing of subsequent barge loads and/or additional management of the material may be determined by EPA in coordination with the project team. Additional management may include activities such as enhanced mixing of materials in the barge to increase sediment homogeneity, additional mixing to distribute any stabilization (treatment) materials, addition of more or different stabilizing materials, or a determination that certain dredge units should be re-designated for disposal. After additional management, confirmatory testing would follow the same tiered and phased protocol as noted above.

Health and Safety Procedures Related to Disposal Determinations

At each point in the removal, handling, treatment (if necessary), transport, and disposal process the status of material present at each location in the process shall be determined and made clear to all personnel present. Where the material has not been designated (either by pre-construction testing or during construction confirmatory testing, where applicable) as Hazardous Waste or Special Waste, all

health and safety procedures (including staff training) shall be consistent with handling of such wastes. Where material is determined to not be Hazardous Waste or Special Waste, all health and safety procedures shall be at least consistent with handling of contaminated non-hazardous wastes. Due to its particular characteristics, MGP waste may be handled using procedures similar to hazardous wastes to ensure health and safety. Changes in these procedures shall be consistent with any changes in the status of the materials during the removal, handling, treatment, transport, and disposal process. For example, for material that is a Hazardous Waste or Special Waste prior to treatment, Hazardous Waste health and safety protocols shall be followed through all steps through treatment completion. Once the material is determined to be non-hazardous after treatment, either by confirmatory testing or the establishment that particular treatment steps yield non-hazardous waste based on EPA's determinations from previous batches, then health and safety procedures consistent with the handling of non-hazardous waste Cleanup Materials may be employed after that time where protective of health and safety. The appropriate procedures for each designation as it relates to specific health and safety regulations and standard practice shall be defined in the construction health and safety plan, which is part of the design documents.

The health and safety procedures and staff training for Hazardous Waste and Special Wastes shall be identical throughout the transport, handling, treatment (if necessary), and disposal process.

Decontamination and Prevention of Material Loss

Decontamination of workers and equipment shall take place regardless of waste designations prior to any site egress (landfill, transload facility, or Gasco site). For example, trucks hauling material to the landfill from the transload facility would need to be decontaminated externally before leaving the transload or landfill. The truck bed would require decontamination after each load should the truck be released to do other work between loads. For dedicated trucks and barges, this could occur at the end of the project. Pre and post sampling data shall be required for any transload facility and/or the site itself to ensure material loss or movement from non-designated areas has not occurred. Should significant increases in

chemical concentrations occur, those areas represented by elevated samples shall have material removed and replaced (e.g. gravel shoulders, catchments).

3.6.3.1 Dock Removal and Usage Evaluations

The cost effectiveness of potential dock removal and/or limiting dock usage during construction shall be fully evaluated and considered in the project EE/CA. This will include evaluation of alternatives that consider the full costs of dock replacement, potential limits on dock usage, and the costs of lost business resulting from those alternatives. Also, the EE/CA shall include a comparison of the short term and long term effectiveness of remedial alternatives that include dock removal or limited usage to those that do not.

Consistent with this risk management framework, dock removal's substantial cost will be weighed against the amount of product underneath which could be removed (in the event deep cores cannot be taken underneath the dock, likely substantial product depths will be interpolated from surrounding cores on at least the upstream, downstream, and riverward side), and the long-term effectiveness of such action as compared to other actions, in the context of a final remedy evaluation. Other factors that will be specifically considered include:

- Limitations for sediment removal related to dock stability
- Extent to which various technologies and alternatives can be adapted to minimize business interruptions
- Technologies for cleanup under existing docks while in place such as:
    - sediment removal
    - capping in place
    - in-place stabilization
    - in-situ treatment
    - and others as identified.

The extent to which these technologies address the permanent effectiveness evaluation criteria will be evaluated in detail.

3.6.3.2 ARARs

ARARs shall be identified for each remedial alternative and shall be consistent with the Portland Harbor site when available. Appropriate temporal scales, spatial scales, and points of compliance for water quality ARARs shall also be evaluated.

3.6.3.3 Long Term Effectiveness

Determination of long term effectiveness of combined alternatives shall be conducted including, as relevant, sediment and water quality thresholds related to: sediment chemical concentrations, sediment resuspension, advective/diffusive flux from sediments to surface water, and fate and transport to biota. Various methods for evaluation of capping effectiveness could include comparison of porewater concentrations to surface water criteria and establishment of site-specific risk based sediment criteria consistent with the Portland Harbor BLRA. Although these methods will be considered, both these example methods do not necessarily have to be used in the EE/CA. Performance standards shall be consistent with those in the Portland Harbor ROD.

3.6.3.4 Upland Source Controls

Cleanup alternatives shall be evaluated in the context of upland groundwater source controls, which will be implemented by this time, including:

- Reviewing groundwater seepage rate reductions as measured or predicted for upland source control performance
- Apply the most up to date estimates of groundwater seepage rates and chemical concentrations (as measured or extrapolated) for evaluation of attenuation (i.e, MNR), capping, and dredging alternatives and their long term effectiveness.
- Evaluating attenuation rate predictions for groundwater and TZW that will not be directly remediated by upland source controls.

This evaluation shall also need to show how proposed riverbank remediation and/or stabilization (which will be implemented at the same time as the sediments remedy implementation) shall prevent recontamination of sediments.

3.6.4 Biological Assessment (BA) and Clean Water Act (CWA) Analysis

As noted above, the EE/CA shall include a draft BA for the preferred alternative to help facilitate NOAA consultation on substantive requirements for the project, as well as a CWA draft 404 memorandum, to include time for Agency reviews and necessary revision to the EE/CA before public review. The BA shall identify the presence of threatened, endangered, proposed or candidate species, or their habitat, within the vicinity of the Site and shall comply with the substantive requirements of the Endangered Species Act. The draft BA shall characterize baseline conditions of existing habitat; address potential project impacts that the remedy may have on these species, their habitat, and their food stocks; and describe best management practices and conservation measures designed to avoid or minimize any negative impacts.

Pursuant to dredging, capping, or other filling components of the EE/CA alternatives, Respondents shall submit a draft memorandum with the EE/CA that provides sufficient information to demonstrate compliance with the substantive requirements of Section 404(b) (1) of the CWA. The memorandum shall document the information gathered regarding practicability and cost, long- and short-term impacts from all proposed alternatives, minimization of adverse effects, and an analysis of the need for any mitigation.

3.7 Design Reports

For the start of the design process, the findings of the EE/CA shall be reviewed and compared with the results of the draft Portland Harbor FS. The preferred alternative(s) from the EE/CA shall be refined and adjusted to be consistent with the draft Portland Harbor FS, which may include adjustments to:

- Finalize the areas and volumes of sediments within the project boundary, per the iterative project area identification discussed in Section 3.4.1.1
- Areas and volumes addressed by particular remedial technologies within the overall alternative
- Adjustments to the alternatives needed to accurately address effectiveness issues as evaluated on a harbor-wide basis.

It is conceivable that the adjusted alternative might alter the conclusions of the EE/CA regarding selection of the preferred alternative. However, close coordination between

Gasco Sediment EE/CA and Portland Harbor FS development will be conducted throughout both processes with express goal of ensuring that EE/CA preferred alternative is consistent with the overall expected Portland Harbor FS findings. Given NW Natural's and EPA's close involvement in both processes, this goal appears to be readily achievable.

Once EPA has selected the cleanup alternative(s) based on the findings of the EE/CA and Portland Harbor FS (if available in a timely fashion), the design process will commence. Design reports shall be submitted to EPA for review in three levels of development: preliminary design, interim design, and final design. Because NW Natural has not yet determined whether a bid process or design build process will be used, the design documents may not be in the form of plans and specifications. Regardless, the design submittals shall be of sufficient detail to adequately describe all aspects of the proposed construction process as detailed more below.

Each phase of the design shall include increasingly detailed content for the following design elements noted under Preliminary Design and Interim Design below. Any additional data collection needed to support design shall be identified and conducted during the preliminary design. Depending on the data types (and any timeframes typically associated with laboratory or other analyses), the results of any such design level data collection shall be presented in either the Preliminary Design or the Interim Design.

3.7.1 Preliminary Design

The preliminary design shall include an overall explanation of the following as appropriate:

- For capping, the preliminary design shall show capping areas and conceptual slope and cap designs including areas of overlap with the riverbank source control designs
- For dredging, the conceptual design shall show dredging areas and conceptual cut thicknesses and slope angles
- The extent of groundwater impacts and predicted attenuation rates
- Performance standards shall be developed for all project areas

- Proposed disposal technology (on-site or off-site) conceptual design including general disposal location, handling methods and transport approaches
- Annotated outline of Interim Design analysis report
- Annotated outline of plan drawings
- Annotated outline of specifications or equivalent descriptions
- Draft Water Quality Monitoring Plan and its associated Quality Assurance Project Plan and FSP. The monitoring plan shall detail water quality monitoring to confirm that water quality standards as defined by substantive requirements of CWA Section 401 water quality certification for compliance with the requirements in CWA Section 404(b)(1) guidelines are met outside of any containment features during any capping or dredging operations including dewater return water (if outside containment and as applicable to the design) that may affect the water column outside containment features. Alternatively, depending on the results of the CWA analysis, the monitoring plan may be designed to determine if any temporary allowance for exceedances of water quality standards that are approved for the project are not greater than allowed under the CWA analysis. The plan shall describe the specific water quality monitoring requirements, including a schedule; sampling locations; sampling intervals; sampling equipment and parameters; analytical methods; key contacts; reporting requirements (including daily reports as applicable); daily contacts for notifications of any exceedances; result summaries; and draft and final Water Quality Monitoring reports.
- The preliminary design shall include a revised BA reflecting ESA agency comments on the draft BA in the EE/CA. This BA shall be further refined, if necessary, for the interim design reflecting the updates of any relevant project elements affecting the BA findings.

3.7.2 Interim Design

The Interim Design shall include three separate deliverables as follows and as detailed below:

- Interim Design Analysis Report
- Interim Construction Documents and Schedule
- Interim Design Plans.

The Interim Design Analysis Report shall provide the design criteria and the basis of design for the remedy. Examples of the types of information to be included are described below:

- Technical parameters and supporting calculations upon which the design will be based, including but not limited to design requirements for each remedial action technology to be employed (e.g., dredging, capping, MNR)
- If the selected alternative includes capping:
    - appropriate physical and chemical characteristics of materials to be used for sediment capping and method for identifying and testing clean source material, including acceptance criteria for such material
    - determinations regarding potential propeller scour for capped areas
    - cap placement techniques.
    - General institutional control requirements endemic to the cap design, for later implementation
- For dredging and/or excavation:
    - Identification of requirements for the contractor regarding the handling, transport (including haul routes) and disposal of dredged or excavated sediments , including identification of any best management practices, monitoring, and/or analyses necessary to protect personnel from potential chemical hazards posed by this remedial action (such activities may be further described in the contractor's HASP)
    - Measures necessary to limit off site movement of contaminants from both in water and upland activities. For in water activities this shall be measured through the water quality monitoring plan. For upland activities, this will be measured through pre and post sampling. Cleanup activities shall be required by EPA for any areas showing evidence of contaminant movement in water or upland as a result of the action. This could include, but is not limited to, actions to limit contaminant exposure pathways such as right of way shoulder soil removal/capping, fringe area capping in water, and other actions deemed necessary.
    - design dredge or excavation depths and overcut allowances, dredged or excavated material volumes, and dredging or excavation techniques

    - identification of potential location(s) for disposal of dredged or excavated sediments
    - For dredged material disposal (off-site)), the design documents shall include descriptions of sediment transloading (from water transport to land transport), stockpiling, dewatering, and overland transport.
- For attenuation of TZW impacts resulting from upland source control actions:
    - Measured and/or predicted attenuation rates and timeframes for reaching RAOs and remediation goals at designated points of compliance
    - Monitoring scope and schedule
- Descriptions of the analyses conducted to select the design approach, including a summary and detailed justification of design assumptions and verification that design shall meet performance standards
- Access and easement requirements, and permit requirements or substantive requirements of permits
- Plan for reducing negative effects on the environment and community during the construction phase(s), including alternative fuel usage/emission control usage to the extent practicable to lower vehicle toxics emissions into surrounding communities, beyond the minimums legally required.
- An outline of the long-term monitoring and reporting plan
- Analysis and recommendations on institutional controls and/or engineering controls that may need to be implemented to ensure the long-term effectiveness of the remedy, including descriptions of how such controls would be implemented, by whom, and under what circumstances such controls could be removed or terminated (see "Institutional Controls", EPA 2000).
- If appropriate, conduct an update of the analysis regarding post remedy recontamination of the Site by upland sources of contamination, including what source control actions have occurred since the EE/CA analysis and whether additional actions may be necessary to control potential sources of significant recontamination.

If the selected alternative includes capping, the cap design shall follow appropriate EPA guidance, including "Guidance for In-Situ Subaqueous Capping of Contaminated Sediments" (EPA 1996). Performance of capping activities shall be consistent with

federal regulations, including the requirements of Sections 401 and 404 of the CWA and Section 10 of the Rivers and Harbors Act. For dredging, the performance standards shall be consistent with federal regulations, including requirements of Sections 404 and 401 of the CWA and Section 10 of the Rivers and Harbors Act.

The Interim Construction Documents and Schedule shall include:

- Construction plans/drawings/sketches and required specifications (note that if NW Natural chooses a design/build approach, specifications may not be needed)
- Proposed locations of processes/construction activity or specific requirements for such locations
- Schedule for construction and implementation of the remedy that identifies major milestones.

The Interim Design Plans shall include:

- Draft Construction Quality Assurance Plan (CQAP) which will detail the remediation verification method and approach to quality assurance during construction activities in the project area, including compliance with ARARs. The CQAP describes the project-specific components of the performance methods and quality assurance program to ensure that the completed project meets or exceeds all design criteria, plans, and specifications. The draft Plan shall be submitted with the Interim Design and the Final CQAP shall be submitted with the Final Design. The Final Plan shall be submitted prior to the start of construction in accordance with the approved construction schedule. The CQAP shall describe the methods used to measure compliance with measurement quality objectives (such as performance and method requirements), including target dredge or excavation depths, if appropriate. The CQAP shall include, as an attachment, a Draft Construction Monitoring Plan, which will include a QAPP and FSP. If the selected alternative includes capping, performance monitoring shall include characterization of in-place capping materials (e.g., coverage and thickness). If the selected alternative includes dredging or excavation, performance monitoring shall be performed to confirm that dredged or excavated material is properly staged, dewatered, and transported to a suitable disposal site; and that field construction activities are

properly sequenced. The CQAP shall provide requirements for the following elements:

- Responsibilities and authorities of all organization and key personnel involved in the remedy construction, including EPA and other agencies.
- Qualifications of the Construction Quality Assurance (CQA) Officer and establishing the minimum training and experience of the CQA Officer and supporting inspection personnel.
- Inspection and verification activities that establish the observations and tests that will be required to monitor the construction and/or installation of the components of the remedy. The CQAP will include the scope and frequency of each type of inspection to be conducted. Inspections will be required to verify compliance with environmental requirements and ensure compliance with all health and safety procedures.
- Performance standards and methods describing activities necessary to implement the removal construction. Performance monitoring requirements will be designed to demonstrate that best management practices have been implemented during dredging operations, dredged or excavated material transportation, and cap placement.
- Sampling activities establishing requirements for quality assurance sampling activities, including the sampling protocols, sample size, sample locations, frequency of testing, acceptance and rejection data sheets, and plans for correcting problems as addressed in the project specifications.
- Documentation establishing the reporting requirements for construction quality assurance activities. This will include such items as daily and weekly summary reports, inspection data sheets, problem identification and corrective measures reports, design acceptance reports, and final documentation. A description of the provisions for final storage of all records consistent with the requirements of the Settlement Agreement shall be included.

- A revised draft Construction Water Quality Monitoring Plan that shall be refined based upon EPA's comments on the Plan submitted under the Preliminary Design and based on the final Water Quality Monitoring and Compliance Conditions Plan issued by EPA.

- Revised draft performance standards that shall be refined based on EPA's comments on the preliminary design
- Construction HASP, which shall include health and safety procedures for all aspects of the construction including: construction activities, construction monitoring, and water quality monitoring.

The Final Design shall include:

- Final Design Analysis Report
- Final construction documents and schedule
- Final Design Plans
- Operation, Maintenance, and Long Term Monitoring Plan
- Final cost estimate for the action and estimated cost for long-term monitoring
- Final schedule.

3.8 Community Involvement

If requested by EPA, Respondent shall provide information supporting EPA's community involvement programs related to the work performed pursuant to this Settlement Agreement and SOW, and shall participate in public meetings that may be held or sponsored by EPA to explain activities at the action or concerning work performed pursuant to the Settlement Agreement and SOW. EPA will coordinate its community outreach efforts with DEQ.

3.9 Contents of Supporting Plans

QAPPs and HASPs are required under this SOW for both data gathering as a part of alternatives evaluation and design as well as actual construction work as listed above. These documents shall adhere to the requirements set forth in the following two subsections.

3.9.1 Quality Assurance Project Plans

The Respondents shall develop project-specific QAPPs for Design data gathering and construction monitoring. These QAPPs shall contain FSPs detailing field methods. The QAPPs shall be based upon the Settlement Agreement, SOW, and EPA guidance. All sampling and analyses performed pursuant to the Settlement Agreement shall conform

to EPA direction, approval, and guidance regarding sampling, quality assurance/quality control (QA/QC), data validation, and chain-of-custody procedures.

The QAPPs shall define DQOs and detail the sampling and data-gathering methods that will be used for each monitoring activity. It shall include sampling objectives, a detailed description of sampling activities, sample locations, laboratory analytical methods, sampling equipment and procedures, sampling schedule, station positioning, and sample handling (e.g., sample containers and labels, sample preservation), and chain of custody procedures.

The QAPP and associated FSP shall be prepared in accordance with, as appropriate, the following guidance:

- "Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual" (EPA 2001a) or the most current version or updated guidance
- EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA 1988)
- "Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation Procedures" (EPA 1990) or the most current version, as guidance for QA/QC and sampling
- "EPA Requirements for Quality Assurance Project Plans (QA/R-5)" (EPA 2001b) and "Guidance on Quality Assurance Project Plans (QA/G-5)" (EPA 2002b) or the most current versions.
- For data validation, "Guidance on Environmental Data Verification and Validation, EPA QA/G8" (EPA 2002c), or the most current version
- EPA Functional Guidelines for Data Review.

The QAPPs shall describe the quality assurance and quality control protocols necessary to achieve required DQOs. The QAPPs shall address sampling procedures, sample custody, analytical procedures, adequate detection limits to meet the DQOs, and data reduction, validation, reporting, and personnel qualifications.

Respondents shall only use laboratories that participate in a QA/QC program that conforms with to the following requirements:

- Quality System that complies with "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs" (ANSI 1994)
- An approved QA program, which complies with "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA 2001c) or equivalent documentation as determined by EPA.
- If a laboratory that is not in the EPA Contract Laboratory Program (CLP) is selected, the QAPPs shall be consistent with the requirements of the CLP for laboratories proposed outside the CLP

Respondents shall provide assurances that EPA has access to laboratory personnel, equipment and records for sample collection, transportation, and analysis at reasonable times and upon reasonable notice by EPA.

Upon request by EPA, Respondents shall have such a laboratory analyze samples submitted by EPA for quality-assurance monitoring. Respondents agree that EPA personnel may audit any laboratory that performs analytical work under this SOW. Prior to awarding any work to an analytical laboratory, Respondents shall inform the laboratory that an audit may be performed, and that the laboratory agrees to coordinate with EPA prior to performing analyses.

Respondents shall provide to EPA the quality assurance/quality control procedures followed by all sampling teams and laboratories performing data collection and/or analysis. Upon request by EPA, Respondents shall allow EPA or its authorized representatives to take split and/or duplicate samples. Respondents shall notify EPA not less than 14 days in advance of any sample collection activity, unless shorter notice is agreed to by EPA. EPA will have the right to take any additional samples that EPA deems necessary. EPA will use its best efforts to notify Respondents not less than 14 days in advance of any sample collection activity EPA conducts and allow Respondents to take split or duplicate samples of any samples it takes as part of its oversight of Respondent's implementation of the work.

All analytical data collected under this SOW shall be provided electronically to EPA.

3.9.2 Health and Safety Plan(s)

Respondents shall submit for EPA review and comment HASP(s) that ensures the protection of the public health and safety during performance of on-Site work under the Settlement Agreement. This plan shall be prepared in accordance with EPA's Standard Operating Safety Guide (PUB 9285.1-03, PB 92-963414, June 1992. In addition, the plan shall comply with all currently applicable Occupational Safety and Health Administration ("OSHA") regulations found at 29 C.F.R. Part 1910. Respondents should refer to diving safety recommendations posted at http://yosemite.epa.gov/R10/CLEANUP.NSF/6d62f9a16e249d7888256db4005fa293/31ae45c9c90a674988256e470062ced9/$FILE/Dive%20Safety%206%2022%202005.pdf in preparing the HASP, to minimize required revisions. Respondent shall incorporate all changes to the plan recommended by EPA and shall implement the plan during the Removal Action.

4 PROJECT SCHEDULE FOR MAJOR DELIVERABLES

Table 1 contains the Schedule for Project Deliverables which is incorporated as an enforceable requirement of this SOW and the Settlement Agreement.

An example schematic project schedule for major project deliverables is summarized in Figure 4. A key aspect of this schedule is recognizing that where practicable EPA comments on a previous submittal may be reflected in the contents of the next submittal if approved by EPA per paragraph 23 of the AOC. To facilitate this, to the extent practicable, EPA will attempt to provide "conditional" approvals indicating additional details expected in the next submittal. The concept behind this process is to avoid repetitive document review/revision cycles. It is recognized in some cases that this may not be the case, and the schedule may need to adjust during the course of the work.

As noted throughout the Statement of Work text, two key linkages between the Gasco Sediments process and larger Portland Harbor process are expected and shown in Figure 4:

- The results of the Harbor RI and BLRAs will inform the Gasco Sediments EE/CA including refinement to determine the Interim Project Area and subareas.
- The results of the Harbor FS will inform the Gasco Sediments Preliminary Design including

- refinement to determine the Final Project Area and subareas
- refinement of the EE/CA preferred alternative(s) for consistency with the Harbor FS preferred alternative.

A third linkage is shown in Figure 4 recognizing that there will be another opportunity to check and refine the final project area based on the final version of the Harbor risk assessment.

5 REFERENCES

ANSI. 1994. Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs E-4. American National Standards Institute.

EPA. 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. EPA/540/G-89/004, OSWER Directive 9355.3-01, October 1988. Washington, D.C.

EPA. 1990. Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation Procedures. OSWER Directive No. 9360.4-01, April 1, 1990. Washington, D.C.

EPA. 1992. EPA's Standard Operating Safety Guide. PUB 9285.1-03, PB 92-963414. Office of Emergency and Remedial Response. Washington, D.C.

EPA. 1996. Guidance for In-Situ Subaqueous Capping of Contaminated Sediments. EPA 905-B96-004, Great Lakes National Program Office. Chicago, Illinois.

EPA. 2000. A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups, EPA 540-F-00-005, OSWER 9355.0-74FS-P, September 2000. Washington, D.C.

EPA. 2001a. Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual. Office of Water. October, 2001. EPA/823/B-01-002. Washington D.C.

EPA. 2001b. EPA Requirements for Quality Assurance Project Plans (QA/R-5). Office of Environmental Information. EPA/240/B-01/003. March 2001. Washington, D.C.

EPA. 2001c. EPA Requirements for Quality Management Plans (QA/R-2). Office of Environmental Information. EPA/240/B-01-002. March 2001. Washington, D.C.

EPA. 2002a. Office of Solid Waste and Emergency Response Memorandum. Subject: Transmittal of Policy Statement: "Role of Background in the CERCLA Cleanup Program" OSWER 9285.6-07P. From: Michael B. Cook, Director s/ Michael B. Cook, Office of Emergency and Remedial Response. To: Superfund National Policy Managers Regions 1 – 10. Signed May 1, 2002

EPA. 2002b. Guidance on Quality Assurance Project Plans (QA/G-5). Office of Environmental Information. EPA/240/R-02/009. December, 2002. Washington, D.C.

EPA. 2002c. Guidance on Environmental Data Verification and Data Validation. EPA QA/G-8. Office of Environmental Information. EPA/240/R-02/004. November 2002. Washington, D.C.

EPA. 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. EPA-540-R-05-012, Office of Solid Waste and Emergency Response, OSWER 9355.0-85. December 2005. Washington, D.C.